

Katalognummer

04163



Polytechnischer
Verein



9
A.D. 1872, 15th FEBRUARY. N° 473. — 535.

Electro-magnetic Telegraphs, &c.

LETTERS PATENT to Sir Charles Wheatstone, of 19, Park Crescent, Regent's Park, Knight, and John Matthias Augustus Stroh, of 29, Tolmers Square, Hampstead Road, Mechanician, both in the County of Middlesex, for the Invention of "**IMPROVEMENTS IN ELECTRO-MAGNETIC TELEGRAPHS AND IN APPARATUS CONNECTED THEREWITH, PARTS OF WHICH IMPROVEMENTS ARE APPLICABLE TO OTHER PURPOSES.**"

Sealed the 9th April 1872, and dated the 15th February 1872.

COMPLETE SPECIFICATION filed by the said Sir Charles Wheatstone and John Matthias Augustus Stroh at the Office of the Commissioners of Patents, with their Petition and Declaration, on the 15th February 1872, pursuant to the 9th Section of the Patent Law Amendment Act, 1852.

5

TO ALL TO WHOM THESE PRESENTS SHALL COME, we, Sir CHARLES WHEATSTONE, of 19, Park Crescent, Regent's Park, Knight, and JOHN MATTHIAS AUGUSTUS STROH, of 29, Tolmers Square, Hamp-

Sir C. Wheatstone & Stroh's Impts. in Electro-magnetic Telegraphs, &c.

stead Road, Mechanician, both in the County of Middlesex, send greeting.

WHEREAS we are in possession of an Invention for "IMPROVEMENTS IN ELECTRO-MAGNETIC TELEGRAPHS AND IN APPARATUS CONNECTED THEREWITH, PARTS OF WHICH IMPROVEMENTS ARE APPLICABLE TO OTHER PURPOSES," and 5 have petitioned Her Majesty to grant unto us, our executors, administrators, and assigns, Her Royal Letters Patent for the same, and have made solemn declaration that we are the true and first Inventors thereof.

NOW KNOW YE, that we, the said Sir Charles Wheatstone and John 10 Matthias Augustus Stroh, do hereby declare that the following Complete Specification under our hands and seals fully describes and ascertains the nature of the said Invention, and in what manner the same is to be performed, in and by the following statement, that is to say:—

The first part of our Invention relates to improvements in the con- 15 struction of step-by-step telegraphs, the object of which is to enable the hand or indicator of a large dial, or in some cases the dial itself, to be moved rapidly with the same certainty as the indicators of the small dials usually employed.

To attain this object we transfer the propelment of the index or 20 pointer to the action of a maintaining power, limiting the work performed by the transmitted currents to the controlling of the scape wheel, and introducing a special arrangement obviating the retarding effect due to the weight of the index hand, as will be clearly shown by the following description of Figures I., II., III., and IV. of the accom- 25 panying Drawings.

DESCRIPTION OF FIGURES I., II., III., AND IV.

On an axis *a*, Figure I., driven by the maintaining power of clock-work gearing with the pinion *x*, is firmly fixed an index hand or pointer *P* and an arm *Z*. At the extremity of this arm a pinion *d* 30 centred at *c* and gearing with the stationary wheel *D*, a segment only of which is shown, carries two equal arms *e*, *e*. Mounted loosely on the axis *a* is a scape wheel *A*, to which one end of a light spiral spring *S* is attached, the other end being fixed to the axis *a*, so that the scape wheel remaining stationary and the axis *a* revolving, the spiral spring *S* 35 would be wound up, and conversely the axis *a* remaining stationary and

Sir C. Wheatstone & Stroh's Impts. in Electro-magnetic Telegraphs, &c.

the scape wheel free to move, the spiral spring in unwinding itself would tend to propel the scape wheel forwards. To the centre of the scape wheel A is fixed the piece *f* carrying at its extremity a stop *n*, which when the scape wheel is at rest is met by the end of one of the arms *e*, *e*, 5 attached to the pinion *d* or to its axis, and thereby the revolution of the axis *a* and consequently the pointer P prevented. The control of the scape wheel is effected by the pallets B, B, to which an oscillatory motion is communicated by any suitable electro-magnetic arrangement (such as that shown at E, E,) in such a way as to allow the scape wheel 10 to advance with a step-by-step motion one-half tooth for every movement of the pallets. It follows from this arrangement that with every movement of the pallets B, B, the scape wheel A driven by the spiral spring S will advance, and this forward movement of the scape wheel will, by withdrawing the stop *n*, release the arm *e* and allow the 15 maintaining power gearing with the pinion *x* to propel the axis *a*, the pointer P, and the arm Z, and thereby to wind up the spiral spring S. The pinion *d* carrying the arms *e*, *e*, at the extremity of the arm Z and gearing with the stationary wheel D, will thus be caused to rotate after the manner of the sun and planet movement until the scape wheel 20 coming to rest locks the whole again by presenting the stop *n* to either of the arms *e*, *e*. The number of teeth on the pinion *d*, the stationary wheel D, and scape wheel A, are so arranged that for every half tooth of the scape wheel liberated by the pallets B, B, the arms *e*, *e*, attached to pinion *d* make one half revolution. It also follows that the 25 pointer P will be allowed to advance one space on the dial for every half tooth of the scape wheel so liberated, and thus while the movements of the pointer are independent of the step-by-step motions of the scape wheel the latter completely controls its starting and stopping.

To prevent the recoil of the index hand when suddenly arrested by 30 one of the arms *e* impinging on the stop *n*, a small catch *p* (see Figure II.) is mounted loosely on the axis *a*, its motion being limited by the stop *r* and the stop *n*. The descent of the end of either of the arms *e*, *e*, will force the bevilled head of the catch *p* back against the spring *y*, which after the descent of one of the arms *e* upon the stop *n*, 35 restores the catch to its former position, so that the end of the arm *e* is held fast between the stop *n* and the catch *p* until the revolution of the scape wheel, by carrying with it the piece *f* and the catch *p*, again releases the arm *e*.

Sir C. Wheatstone & Stroh's Impts. in Electro-magnetic Telegraphs, &c.

From the above arrangement it will be perceived that the starting and stopping of the scape wheel is not affected by the inertia or momentum of the heavy index hand, which is enabled to start and come to rest after the scape wheel.

Another method of effecting this purpose is shewn in Figure III. 5 To the pointer P fitting loosely on the axis *a* is attached a counterbalance H, provided at one extremity with a notch (not shown in the Drawing), through which a pin K fixed to the circumference of the scape wheel passes; the piece H carries a delicate spring J, so bent that when at rest the pin K is held by this spring in the centre of the 10 notch.

For the purpose of restoring the index hand when out of adjustment to the + or zero point on the dial, the axis *b* of the pallet B, B, is centered in the shorter arm of a bell-crank lever F, F, Figure III., which is centred at C and held in normal position by a spring. Any pressure at I will 15 cause an upward movement of the shorter arm of F, F, thereby lifting the pallets B, B, out of gear with the teeth of the scape wheel. Thus freed the scape wheel, propelled by the maintaining power, will fly round, carrying with it the pointer P and counterbalance H until the pin or projection on the extremity of H meets the pin L projected 20 forward by the pressure at I. Or in the case of the arrangement shown in Figure I. the scape wheel will revolve until either of the arms *e*, *e*, impinges upon the stop *n*, and in both cases the index hand points to zero. The removal of the pressure at I allows the pallets to re-engage with the teeth of the scape wheel. 25

In place of the index hand pointing to letters or signs engraved upon a fixed dial a moving dial Q (Figure IV.) of any desired dimensions passing beneath a fixed screen S (having a perforation permitting only one letter engraved on the moving dial to appear at a time) may be mounted upon the axis *a*, as is well understood. 30

This part of the Invention is equally adaptable to all applications of that form of the electric telegraph in which the step-by-step principle is employed, such as telegraph clocks, in which the regulating power resides in a distant clock; telegraphic counters, which indicate the recurrence of distant motions; signal apparatus for railways and for 35 other purposes in which signs or sentences may be substituted for letters and figures.

Sir C. Wheatstone & Stroh's Impts. in Electro-magnetic Telegraphs, &c.

The second part of our Invention relates to improvements in type printing telegraphs, and is shown at Figures V., VI., VII., and VIII. The first of these consists in the application of the means previously described for moving a large hand with steadiness and rapidity, to
5 regulating the motion of the type wheel, the second to the means employed by which the stamping of a letter on the paper strip is effected automatically immediately after the cessation of the last of the electric currents necessary to bring the type wheel to the requisite position, and the third to the peculiar contrivance for regularly supply-
10 ing ink to the type wheel.

DESCRIPTION OF FIGURES V., VI., VII., AND VIII.

Mounted on the axis *a* (Figure V.) in place of the pointer or index hand is a wheel R gearing with another wheel Y fixed firmly on the arbor of the type wheel. By means of these wheels the maintaining
15 power moving the type wheel is controlled by the pallets B, B, as described in the first part of our Invention. Also mounted on the arbor of the type wheel is a saw-toothed wheel Z, and in play with the teeth of this wheel is a pin *m* fixed into the extremity of the arm E, this arm being centred at *e* and continuing in a light rigid bar E' bearing on a
20 friction wheel *f*. During the rotation of the wheel Z the pin *m* cannot fall to rest between any of the teeth, and the arm E is therefore kept up. The pin *m* passes in its upward motion against a segmental arm *d* centred at C, at which also is centred the arm *n* bearing against a pin in the segmental arm *d*, and sustains these two arms, keeping the releasing
25 arm L, which is centred at *i*, free from the pin 1 at the end of the arm *n*, and allowing a bent end or check piece of the releasing arm L to rest upon the pin 2 in the arm *y*, which is centred half way up the arm *n* and kept in position by a spiral spring S. A continuation *n*¹ of the arm *n* has pivoted at its extremity a light bar *n*² bearing upon friction
30 wheels.

When the rotation of the wheel Z ceases the pin *m* and the arms *d* and *n* fall, and before the end of the releasing arm L can engage with pin 1 the check piece is liberated from its position of rest on pin 2 and the arm L falls. A transverse groove in the arbor of the arm L
35 retains the end of a piece *j* jutting from the axle of a pinion *p* gearing with a wheel N fixed on the arbor of a second wheel M having widely-spaced teeth, which we call the stamping wheel. With a pinion *w* also

Sir C. Wheatstone & Stroh's Impts. in Electro-magnetic Telegraphs, &c.

on the arbor of the stamping wheel a maintaining power separate and different from that imparting motion to the type wheel is in gear. The fall of the arm L liberates the piece *j*, and this piece in making one revolution before it again engages in the groove of the arbor of the arm L permits the stamping wheel to be carried forward one tooth by 5 the maintaining power in gear with it. The tooth of the stamping wheel coming into contact with the touch piece *h*, Figure VI., causes the printing hammer *x* to be lifted against the rim of the type wheel T. Consequently the letter immediately presented to the face of the printing hammer is printed on the paper strip which intervenes between 10 the type wheel and the hammer. The action on the printing hammer is direct, but in the case of the arm L a series of levers *r, r, r*, Figure V., are brought into play.

After the printing of a letter the paper slip is carried forward as heretofore by a milled wheel W fixed to the arbor of the stamping 15 wheel, and which bears on a roller G pressed against the milled wheel by a spring, the paper slip passing between the milled wheel and the roller.

The ink is supplied to the type wheel by means of a brush-inking wheel I., Figure VI., which rests on and is caused to revolve by the 20 rim of the type wheel. The ink is supplied to the inking wheel by means of the arm K, which is loosely attached to the arbor of a wheel in gear with the train of the maintaining power moving the type wheel. The arm is carried up by means of a pin *i*, and having at the lowest point of its revolution dipped into a semicircular or other shaped ink 25 vessel, it falls in its revolution into contact with the inking wheel, imparting to it its charge of ink.

The type wheel is adjusted to zero by the arrangement described for adjusting the index hand or pointer of the first part of our Invention.

Figure VII. represents a front, and Figure VIII. a back, view of the 30 complete printing instrument. The former shows the type wheel T, upon the upper right hand side of which rests the inking wheel I, which is supplied with inking fluid by the arm K dipping in its revolution in the semicircular or other shaped ink trough. Figure VIII. shows the same mechanism as Figure V. to a smaller scale. 35

Our third improvement is shown at Figures XIII. and XIV., and refers to a switch or current director to be used with telegraphic appa-

Sir C. Wheatstone & Stroh's Impts. in Electro-magnetic Telegraphs, &c.

ratus constructed according to our Invention, or with other descriptions of telegraphic apparatus. It consists of a series of finger studs or keys so disposed that on the pressure of any one key the current is directed into a new channel, and at the same time diverted from the previous
5 one.

DESCRIPTION OF FIGURES XIII. AND XIV.

Figures XIII. represent a front and a side view of a four-keyed switch constructed on this principle, and Figure XIV. represents a back view thereof. A is a frame into which are fitted four studs S, S, S, S, sliding in holes having lateral slits to admit the screws connecting the
10 moveable pulleys P, P, P, P, with the stems of the studs; similar pulleys P¹, P¹, P¹, are placed in the same line between the others, and a chain or cord H fixed at each end passes alternately over and under the pulleys with only sufficient slack to allow of one key being depressed at
15 the same time. R is a screw to which one pole of the magneto-electric motor or voltaic battery is attached, its other pole being connected with the return or earth wire. D, E, F, G, represent the ends of the wires to which the currents from R can be communicated at will. They are attached to the springs or pieces of metal C, C, C, C, Figure XIV.,
20 insulated from the rest of the instrument by some non-conducting material B, B; upon the depression of a stud the end of it will touch a spring and make a metallic contact therewith. The stud will remain thus in contact until another stud is depressed, and it will be seen that in this arrangement, which is capable of extension to any number of
25 keys or studs, only one can be depressed and one contact made at the same time. The mechanism on which the peculiarity of this switch depends resembles that employed in the magnetic communicator of an alphabetic telegraph described as the sixth improvement in the Specification of a Patent granted to one of us dated 2nd June 1858, No. 1241,
30 but we now claim it when applied to an instrument for a very different purpose, namely, that of directing currents from one line to another.

Our fourth improvement is shown at Figures IX., X., XI., and XII., and consists in the construction of a magneto-electric apparatus suited for the purpose of providing in an effective manner the currents
35 necessary to ring electro-magnetic bells at distant places.

By the following construction, represented in Figures IX. and X., the magneto-electric machine and its accompanying mechanism occupies a

Sir C. Wheatstone & Stroh's Impts. in Electro-magnetic Telegraphs, &c.

much smaller space than any hitherto contrived for a similar purpose, a matter of importance when the apparatus is to be inserted in a wall or partition.

Attached by iron connecting bars to the poles of the compound permanent magnets M, M, Figure IX., are the soft iron cores of two 5 bobbins B, B¹, upon which is wound a quantity of insulated wire, the two ends of the wire being in connection the one with the return wire or earth, and the other with the wire attached to the coils of the distant bell, by which means the bobbins B, B¹, are placed within the space enclosed by the magnets M, M. The armature hinged on the brass 10 slope X, X, is raised from both the soft iron cores and the bobbins simultaneously, when the pull is depressed by the cams C, C, C, arranged in a circle and playing upon a friction roller R mounted in the face of the armature. The cams work with the forward motion of the arbor A of the pull or bell handle through the click and ratchet C¹ 15 and D on the depression of the bell handle, therefore the cams raise the armature and permit it to fall several times, but on the return of the handle the click runs on the ratchet and the armature remains unmoved, consequently several reversed currents are dispatched into the wire connected with the distant bell. 20

a and *b*, Figures IX. and X., are two springs, one of which is in metallic contact with a piece of brass insulated from the body of the instrument. When the pull is in its position of rest, as shown in the Drawings, the circuit is interrupted, but when the pull is depressed both springs press on the insulated brass piece, and the currents generated 25 in the coils pass into line. By means of this temporary completion of the circuit the currents are compelled to go into only the proper channel, and thus avoid ringing other bells in the same system.

When the motions of the armature of the magnet are to be effected by a direct instead of a circular pull we adopt the following arrangement, 30 as shown at Figures XI. and XII.

Attached to the poles of the permanent horse-shoe magnets M¹, M¹, Figures XI. and XII., are the soft iron cores of two bobbins B, B¹, upon which is wound a quantity of insulated wire, the two ends of the wire being in connection the one with the spring *d* and the other with 35 the wire attached to the coils of the distant bell. The armature attached to the hinged piece *x*¹ is raised from both the soft iron cores and bobbins

Sir C. Wheatstone & Stroh's Impts. in Electro-magnetic Telegraphs, &c.

simultaneously when the pull is drawn out by the cams C, C, C, arranged horizontally and playing upon a friction roller R mounted at the end of the piece x^1 . The cams work with the horizontal motion of the cam piece D, to which the handle H is attached, on the withdrawal of which
5 the cams raise the armature and permit it to fall several times, and consequently several reversed currents are despatched into the wire connected with the distant bell. When the pull is in its position of rest, as shown in the Drawing, the circuit is interrupted, but when the pull is withdrawn the spring d presses on the guide c , which keeps the
10 piece D in its proper position, and the currents generated pass into the line.

Figure XV. represents the general disposition of a circuit including, 1st, a magneto-electric bell pull 1; 2nd, the finger-keyed switch 2 for the purpose of directing the electric currents into different lines in
15 order to act either on distinct bells or on different tell-tales connected with a single bell; and 3rd, a bell 3 with its associate tell-tales.

Having thus described the nature of our said Invention, and the mode in which we carry the same into effect, we would have it understood that what we claim is,—

20 First. The means by which the motion of a hand dial or type wheel of an electro-magnetic telegraph is rendered independent of the step-by-step movement of the propellant actuated by the successive currents transmitted through the line, so that the hand dial or type wheel started by the first current moves continuously until it is arrested by a stop
25 brought to the resting position by a step-by-step movement, in manner substantially as herein shown and described.

Second. The means by which the hammer which strikes the paper against the type wheel is caused to act immediately after the cessation of the series of currents necessary to bring the type wheel to the
30 required position, in manner substantially as herein shown and described.

Third. The method of inking the type wheel above described, by which a revolving arm moving through a reservoir of fluid ink periodically supplies the ink to a revolving brush pressing against
35 and moving with the type wheel, in manner substantially as herein shown and described.

Sir C. Wheatstone & Stroh's Impts. in Electro-magnetic Telegraphs, &c.

Fourth. The means described of transferring electric currents from one line to another by means of finger keys, the elevation of the last-used finger key being effected on pressing any other by its action on a chain, in manner substantially as herein shown and described.

Fifth. The arrangement and construction of the two magneto-electric machines for ringing electro-magnetic bells, in manner substantially as above described and represented in Figures IX. and X., and XI. and XII.

In witness whereof, we, the said Sir Charles Wheatstone and John Matthias Augustus Stroh, have hereunto set our hands and seals, this Fourteenth day of February, in the year of our Lord One thousand eight hundred and seventy-two.

C. WHEATSTONE. (L.S.)

A. STROH. (L.S.)

Witness,

B. J. B. MILLS,

Patent Agent,

35, Southampton Buildings,
London.

15

LONDON:

Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1872.

FIG. 5.

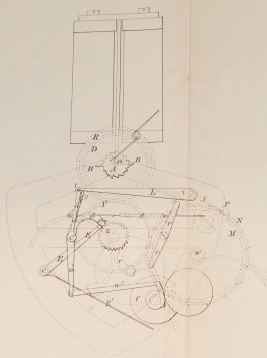


FIG. 6.

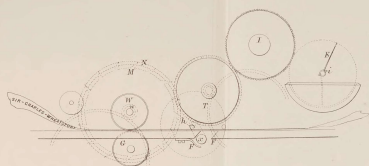


FIG. 1.

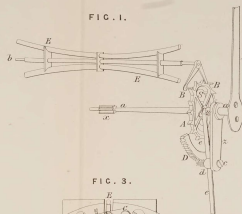


FIG. 4.

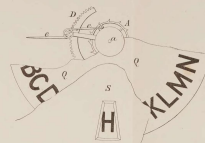


FIG. 3.



FIG. 2.



FIG. 7.

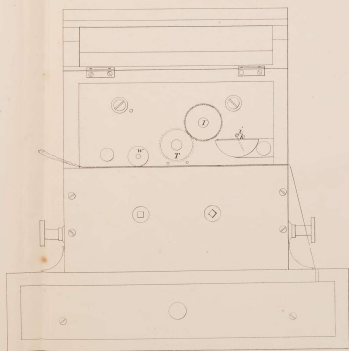


FIG. 8.

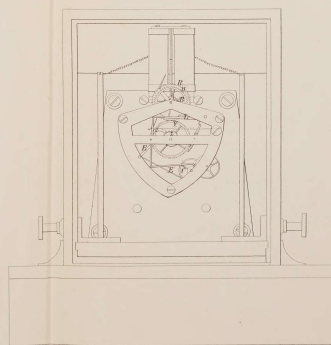


FIG. 10.

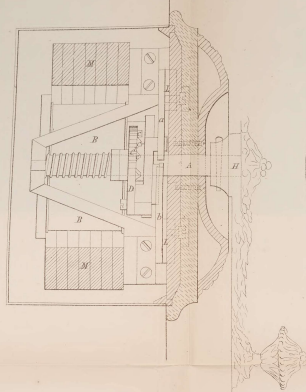


FIG. 9.

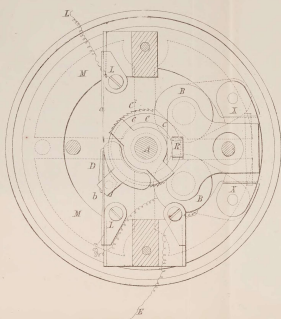


FIG. 11.

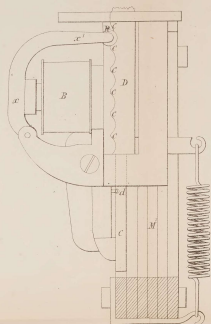


FIG. 12.

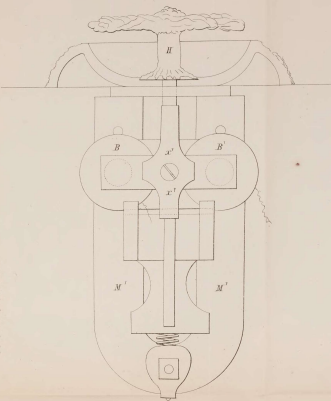


FIG. 13.

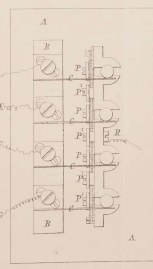
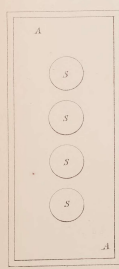
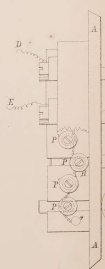


FIG. 14.

FIG. 15.

